Strategies for Converting from Cool-Season Turf to Warm-Season Turf for Water Conservation

J. Michael Henry, Farm Advisor
UC Cooperative Extension, Riverside County

Brent Barnes and Jim Baird
Department of Botany and Plant Sciences
University of California, Riverside

David Shaw, Farm Advisor
UC Cooperative Extension, San Diego County

Objectives: In 2008, a pilot study was initiated to determine optimal timing and planting rate of UC Verde buffalograss plugs along with eradication method of tall fescue to achieve the most rapid conversion to buffalograss with the least amount visual discoloration.

Location: UCR Turf Facility

Soil: Hanford fine sandy loam

Experimental Design: Randomized complete block with 3 replications

Plot Size: 5’ by 10’

Species/Cultivars: Mature stand of ‘Crossfire 2’ tall fescue; UC Verde buffalograss

Application of Roundup ProMax: 8/19/2008, 4.7 qts/A

Application Information:
- CO$_2$ Bicycle sprayer
- TeeJet 8002VS Nozzles
- 19” nozzle spacing
- 22’ boom height
- Speed: 1 mph
- Output: 2gal/1000ft$^2$
- Pressure: 41 psi @tank and 38 psi @handle
- Calibration of 1060 ml/nozzle/minute

Plugs Established: 8/29/2008

Fertility: 0.5 lb N/1000 ft$^2$ approximately every month

Mowing Height: 3 inches

Irrigation Regimes: Once the buffalograss overcame transplant shock, plots were to be irrigated according to buffalograss water use needs. This was not done until 2008

Data Collection: Buffalograss rate of establishment and cover

Acknowledgments: Special thanks to Florasource, Ltd. and Monsanto for donating the UC Verde buffalograss and Roundup herbicide, respectively.
North

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>9</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>10</th>
<th>4</th>
<th>6</th>
<th>9</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>12</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>6</th>
<th>10</th>
<th>8</th>
<th>12</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>9</td>
<td>2</td>
<td>11</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**Treatments**
1. Roundup entire plot, plant plugs at 6” spacing
2. Roundup entire plot, plant plugs at 12” spacing
3. Roundup entire plot, plant plugs at 18” spacing
4. Remove sod, plant plugs at 12” spacing
5. Roundup 10” strips, plant plugs within at 12” spacing
6. Roundup 10” strips, plant plugs within at 12” spacing; intended to repeat procedure on adjacent living turf in June 2009 (not completed)
7. Plant plugs at 12” spacing in untreated tall fescue turf
8-12. Same as treatments 1-7, but intended to plant in June and August 2009 (not completed)
Table 1. Establishment rate of UC Verde buffalograss and weed encroachment during conversion from tall fescue.

<table>
<thead>
<tr>
<th>Cover</th>
<th>% Buffalo 10-2-2008</th>
<th>% Buffalo 11-10-2008</th>
<th>% Buffalo 12-4-2008</th>
<th>% Poa annua 5-12-2009</th>
<th>% Buffalo 5-12-2009</th>
<th>% Poa annua 5-12-2009</th>
<th>% Broadleaf 5-12-2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Roundup; 6 inch spacing</td>
<td>57</td>
<td>83</td>
<td>90</td>
<td>9</td>
<td>92</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. Roundup; 12&quot;</td>
<td>30</td>
<td>58</td>
<td>67</td>
<td>17</td>
<td>83</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3. Roundup; 18&quot;</td>
<td>7</td>
<td>18</td>
<td>23</td>
<td>22</td>
<td>56</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>4. Remove sod; 12&quot;</td>
<td>38</td>
<td>55</td>
<td>73</td>
<td>2</td>
<td>96</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5. Roundup strips; 12&quot;</td>
<td>10</td>
<td>13</td>
<td>15</td>
<td>3</td>
<td>25</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6. Roundup strips; 12&quot;</td>
<td>10</td>
<td>17</td>
<td>18</td>
<td>2</td>
<td>28</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7. Untreated tall fescue; 12&quot;</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSD (P=.05)</td>
<td>9.4</td>
<td>13.6</td>
<td>21</td>
<td>6.7</td>
<td>14.6</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>CV</td>
<td>23.6</td>
<td>21.5</td>
<td>27.9</td>
<td>41.8</td>
<td>12.7</td>
<td>151</td>
<td></td>
</tr>
</tbody>
</table>

Results:

- Most rapid conversion occurred by eradicating existing stand of tall fescue and planting UC Verde on 6-inch spacing.
- 12-inch spacing resulted in slower establishment, but faster than 18-inch spacing.
- Removing sod prior to plugging did not provide an advantage for establishment of buffalograss compared to treatment with Roundup.
- Plugging UC Verde into living tall fescue turf is not advised.

Table 2. Effects of Revolver (foramsulfuron) herbicide applied on 8-11-09 on UC Verde buffalograss tolerance and control of tall fescue and weeds.

<table>
<thead>
<tr>
<th>Description</th>
<th>Turf Injury (1-9,1=worst)</th>
<th>Turf Quality (1-9,9=best)</th>
<th>% Leaf Fire (0-100)</th>
<th>% Spurge Control (0-100)</th>
<th>% Dandelion Control (0-100)</th>
<th>Turf Quality (1-9,9=best)</th>
<th>% Leaf Fire (0-100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>8-19-2008</td>
<td>8-26-2009</td>
<td>9-09-2009</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Revolver 18oz/Acre</td>
<td>7</td>
<td>7</td>
<td>12</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>2. Untreated</td>
<td>7</td>
<td>7</td>
<td>17</td>
<td>7</td>
<td>13</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>3. Revolver 26oz/Acre</td>
<td>7</td>
<td>7</td>
<td>18</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>4. Untreated</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>12</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>5. Untreated</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>28</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>6. Revolver 26oz/Acre</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>90</td>
<td>6</td>
<td>90</td>
</tr>
<tr>
<td>7. Revolver 26oz/Acre</td>
<td>4</td>
<td>3</td>
<td>57</td>
<td>2</td>
<td>88</td>
<td>2</td>
<td>88</td>
</tr>
<tr>
<td>8. Revolver 26oz/Acre</td>
<td>7</td>
<td>5</td>
<td>23</td>
<td>20</td>
<td>40</td>
<td>2</td>
<td>90</td>
</tr>
<tr>
<td>9. Untreated</td>
<td>7</td>
<td>7</td>
<td>2</td>
<td>30</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10. Revolver 18oz/Acre</td>
<td>5</td>
<td>3</td>
<td>57</td>
<td>2</td>
<td>87</td>
<td>2</td>
<td>87</td>
</tr>
<tr>
<td>11. Revolver 26oz/Acre</td>
<td>5</td>
<td>4</td>
<td>38</td>
<td>2</td>
<td>88</td>
<td>2</td>
<td>88</td>
</tr>
<tr>
<td>12. Untreated</td>
<td>5</td>
<td>5</td>
<td>38</td>
<td>6</td>
<td>32</td>
<td>6</td>
<td>32</td>
</tr>
<tr>
<td>LSD (P=.05)</td>
<td>1.9</td>
<td>1.9</td>
<td>30.4</td>
<td>NS</td>
<td>NS</td>
<td>1.2</td>
<td>26.7</td>
</tr>
<tr>
<td>CV</td>
<td>18.4</td>
<td>20.1</td>
<td>76.7</td>
<td>NS</td>
<td>NS</td>
<td>14</td>
<td>34.5</td>
</tr>
</tbody>
</table>

Results:

- Revolver caused only slight and short term discoloration on UC Verde buffalograss at both application rates and would serve as a good choice for selective removal of tall fescue and several weed species during conversion.
On August 11, 2009, a second study was initiated to evaluate safety of Revolver (foramsulfuron) herbicide on UC Verde buffalograss and efficacy against tall fescue and weeds. Revolver was applied at 18 oz product/A on treatments 1 and 10 listed above, and 26 oz product/A on treatments 3, 6, 7, 8, and 11. Methylated seed oil was added to the tank at 0.5% v/v. The remaining treatments were untreated.

In 2009, a second turf conversion study was initiated at the UCR Turfgrass Research Center in Riverside and at the South Coast Field Station in Irvine.

Objectives

1. Investigate the most efficient and effective method(s) for converting turf from cool-season to warm-season species, thereby significantly reducing water use.
2. Compare five warm-season species and two establishment methods (seeding vs. plugging) in inland and coastal climates in southern California.
3. Evaluate use of a colorant in addition to mowing and fertility practices to offset or delay turf discoloration during conversion and dormancy.

Study Locations

1. UCR Turfgrass Research Facility, Riverside
2. South Coast Research Field Station, Irvine

Existing Study Conditions

1. Mature tall fescue turf maintained under lawn conditions
2. Mowed 1-2 times/week at 2 inches using a rotary mower
3. Irrigated at ≥80% ET to maintain green color
4. 4+ lbs N/1000 ft²/yr

Conversion Methods Prior to Planting

1. Apply nonselective herbicide (Roundup Pro Max) to eradicate tall fescue
2. Scalp tall fescue turf down to lowest height adjustment on rotary mower
3. Leave tall fescue as is

Turfgrass Species and Establishment Methods

1. ‘Tifsport’ hybrid bermudagrass plugs (chosen because of fall color retention and less aggressive growth habit)
2. ‘DeAnza’ zoysiagrass plugs (UCR release chosen because of fall color retention)
3. ‘UC Verde’ buffalograss plugs (UC release chosen because of exceptional drought resistance)
4. ‘Palmetto’ St. Augustinegrass plugs (species chosen because of shade tolerance)
5. ‘Sea Spray’ seashore paspalum plugs (species chosen because of exceptional salt tolerance)
6. ‘NuMex Sahara’ bermudagrass seed
7. ‘Sea Spray’ seashore paspalum seed

1.25-inch diameter plugs planted on 12-inch spacing
Seeding rate: 1 lb pure live seed/1000 ft² broadcast after solid tine aeration
Turfgrass Colorant

1. Half of each plot will be treated with Greenlawnger colorant every 3-5 weeks to help mask discoloration due to conversion practices and winter dormancy.

Study Conditions After Conversion

1. Syringed lightly 5 times/day for 3 weeks following planting.
2. Reduced irrigation to 60% ET₀ to favor warm-season grasses
3. Mow scalped and Roundup plots 1-2 times/wk at 1.5 inches using a reel mower
4. Mow remaining plots 1-2 times/week at 2.5 inches using a rotary mower
5. 4 lbs N/1000 ft²/yr with rates and frequency designed to optimize winter color retention based on previous research
6. Weed control as needed to maintain uniformity
7. Possible use of a selective herbicide like Revolver that will eradicate tall fescue and weeds from the stand of warm-season turf

Experimental Design

1. Completely randomized split (turf colorant) block with 3 replications per study location
2. 7 species/establishment methods x 3 conversion methods x 3 replications = 63 plots
3. Main plots: 7 ft x 7 ft; sub-plots 3.5 ft x 7 ft
4. 3,087 ft² study area/location

Ratings (monthly or as needed)

1. Warm-season turf cover (using 12-inch grid )
2. Turf quality
3. Turf color
4. Fall/winter color retention/spring greenup
5. Weed encroachment

Study Timeline

1. UCR study was planted on June 19, 2009 and South Coast study on July 15, 2009

Acknowledgments

Special thanks to West Coast Turf and Florasource, Ltd. for donations of plant materials, and to Monsanto, Target Specialty Products, and Becker Underwood for donating chemicals.
Turf Conversion Study Plot Map

North

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>19</td>
<td>8</td>
<td>16</td>
<td>18</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>17</td>
<td>20</td>
<td>7</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>II</td>
<td>21</td>
<td>1</td>
<td>11</td>
<td>3</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>15</td>
<td>8</td>
<td>12</td>
<td>1</td>
<td>19</td>
</tr>
</tbody>
</table>

South

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>16</td>
<td>10</td>
<td>18</td>
<td>7</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>3</td>
<td>4</td>
<td>9</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>II</td>
<td>17</td>
<td>7</td>
<td>11</td>
<td>8</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>3</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>III</td>
<td>20</td>
<td>6</td>
<td>18</td>
<td>5</td>
<td>12</td>
<td>2</td>
</tr>
</tbody>
</table>

O = Controller

1. No Removal, Tifsport Bermuda
2. No Removal, De Anza Zoysia
3. No Removal, UC Verde Buffalo
4. No Removal, Palmetto St. Augustine
5. No Removal, Sea Isle 1 Seashore Paspalum
6. No Removal, Princess 77 Bermuda Seed
7. No Removal, Sea Spray Seashore Paspalum Seed
8. Scalp, Tifsport
9. Scalp, De Anza
10. Scalp, UC Verde
11. Scalp, Palmetto
12. Scalp, Sea Isle 1
13. Scalp, Princess 77 Seed
14. Scalp, Sea Spray Seed
15. Round Up, Tifsport
16. Round Up, De Anza
17. Round Up, UC Verde
18. Round Up, Palmetto
19. Round Up, Sea Isle 1
20. Round Up, Princess 77 Seed
21. Round Up, Sea Spray Seed